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Performance Specification For the Enhanced Grenade Launcher Module (EGLM) System

**Revision - T
16 September 2003**

1. SCOPE.

1.1 Scope. This document establishes the performance requirements for the 40mm Enhanced Grenade Launcher Module (EGLM) solicitation for the Special Operations Peculiar Modification (SOPMOD) Kit. The SOPMOD program is a United States Special Operations Command (USSOCOM) sponsored program, which supports Army, Navy, and Air Force Special Operations Forces (SOF) Units. The SOPMOD Program Management Office (PMO) at Crane, IN, provides standardized, versatile weapons accessories to meet the needs across SOF mission scenarios. These accessories increase operator survivability and lethality by enhanced weapon performance, target acquisition, signature suppression, and fire control. SOPMOD PMO provides these accessories when they are operationally suitable, affordable, sustainable, and funded.

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

2.1.1. Specifications and Standards. The following specifications and standards form a part of this Performance Specification and will be used for guidance, or to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

Standards, Military:

MIL-STD-461E	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-A-8625F	Anodic Coatings for Aluminum and Aluminum Alloys
MIL-STD-130K	Identification Marking of U.S. Military Property
MIL-STD-882D	System Safety
MIL-STD-810F	Environmental Test Methods and Engineering Guidelines
MIL-STD-1425A	Safety Design Requirements for Military Lasers and Associated Support Equipment, 30 August 1991
MIL-STD-1913	Dimensioning of Accessory Mounting Rail For Small Arms Weapons
MIL-STD-1916	DOD Preferred Methods for Acceptance of Product
MIL-M-7298	Manual, Technical: Commercial Equivalent
MIL-HDBK-61A	Configuration Management Guidance

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MIL-HBK-454A General Guidelines for Electronic Equipment

MIL-PRF-63016B Manuals, Technical: Munitions Equipment

NAVSEA SW010-AD-GTP-010 Small Arms and Special Warfare Ammunition

CECOM TB 7 (Rev A) Battery Compartment Design Guidelines for
Equipment Using Lithium-Sulfur Dioxide Batteries, October 1997

Other Reference Documents:

Title 10 United States Code (10 U.S.C.)

DoDD 3200.11 Major Range and Test Facility Base

AR 70-1 Army Acquisition Policy

AR 70-25 Use of Volunteers as Subjects of Research

AR 73-1 Army Test and Evaluation Policy

AR 360-5 Army Public Affairs, Public Information

AR 380-5 Department of the Army Information Security

AR 380-10 Technology Transfer, disclosure of Information

AR 385-16 System Safety Engineering and Management

DA Pam 73-1 Test and Evaluation in Support of System Acquisition

DA Pam 73-4 Developmental Test and Evaluation Guidelines

DA Pam 73-5 Operational Test and Evaluation Guidelines

DA Pam 73-6 Live Fire Test and Evaluation Guidelines

DA Pam 70-3 Army Acquisition Handbook

DA Pam 73-2 Test and Evaluation Master Plan (TEMP) Procedures and
Guidelines

DA Pam 73-3 Critical Operations Issues and Criteria (COIC)
Procedures and Guidelines

DA Pam 73-7 Software Test and Evaluation Guidelines

DA Pam 350-38 Standards in Weapons Training (STRAC Manual)

DoD Guidebook INTERIM DEFENSE ACQUISITION GUIDEBOOK, October 30, 2002
(Formally the DoD 5000.2-R, dated April 5, 2002)

DOTe Policy Memorandum Policy for Conducting Operational Test and
Evaluation of System Interoperability dated June 15,
1999

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DOTe Policy Memorandum Policy on Operational Test and Evaluation of
Electromagnetic Effects and Spectrum Management dated
October 25, 1999

MOA Multi Service Operational Test and Evaluation (MOT&E)
and Joint Test and Evaluation (JT&E), April 1999

Joint Publication 1-02 DoD Dictionary of Military and Associated Terms

ATEC Pam 73-1 System Test and Evaluation Procedures, December 10,
1999

USSOCOM Dir 70-1 Research, Development, and Acquisition, 11 Apr 01

USSOCOM Special Text Special Operations Peculiar Modification (SOPMOD)
Accessory Kit for the M4A1 Carbine, ST 23-31-1,
January 30, 1999

TEXCOM Memo 73-1 Test Officer's Planning Manual, Oct 91

TOP 3-2-609 Test Operating Procedure (TOP), Chemical Compatibility
of Nonmetallic Materials

TOP 4-2-602 Rough Handling Tests

TOP 1-2-502 Durability, dated 19 Dec 1984

TOP 1-2-610 Human Factors Engineering, dated 15 May 1990

TOP-3-2-030 Grenade Launchers, dated 13 March 1987

TOP/MTP 3-1-002 Reliability

TOP 3-2-045 Automatic Weapons, Machine Guns, Hand and Shoulder
Weapons

OPNAVINST 5100.27 Navy Laser Hazards Control Program

Code of federal Regulations (CFR) Title 21, Part 1040.10

Operational Requirements Document (ORD) United States Special Operations
Command (USSOCOM) Operational Requirements Document for
the Special Operations Peculiar Modification (SOPMOD)
Kit for the M4A1 Carbine, October 29, 1999

EGLM ORD Annex to the SOPMOD ORD ([IN DRAFT](#))

Performance Specifications for the SOF Combat Assault Rifle (SCAR) Light
(Crane PS/4081/C03/1337)

Performance Specifications for the SOF Combat Assault Rifle (SCAR) Heavy
(Crane PS/4081/C03/1338)

DODINST 4140.52 Department of Navy Physical Security Instruction for
Conventional Arms, Ammunition, and explosives
(AA&E) (current version)

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NAVSEA Instruction 8370.2 Small Arms and Weapons Management Policy and Guidance Manual

DoD Directive 5100.76 Physical Security Review Board (current version)

2.2 Non-Government Publications.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

ANSI B46.1 Surface Texture (Surface Roughness, Waviness and Lay)

ANSI Y32.3 Welding and Brazing (Requests for copies of this document should be forwarded to the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10036 Telephone (212) 705-7722.)

ANSI IPC J-STD-001A Requirements for Soldered Electrical and Electronic Assemblies

ANSI Z136.1 American National Standard for the Safe Use of Lasers

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

ASTM E709 Standard Guide for Magnetic Particle Examination

ASTM E1444 Standard Practice for Magnetic Particle Inspection

ASTM E1417 Practice for Liquid Penetrant Examination

NOTE: The following information is provided for development of EGLM ballistic solutions.

(a) **40mm (Low Velocity) Ballistics:** The EGLM barrel length in internal ballistic characteristics of each candidate EGLM will result in altered ammunition ballistics. Vendors are responsible for developing and providing ballistic solutions for their candidate EGLM.

(b) **US ARDEC Ballistic Table, M203 Ballistics** created 26 May 1998 maybe available (currently being updated). Point of Contact for 40mm Low Velocity is Mr. John Whiteside, Aberdeen Proving Grounds, MD. Phone: 410-278-3880, E-mail: whiteside@pica.army.mil. Crane has no 40mm Ballistic Tables.

(c) **Reference/Accuracy Test Ammunition:** The material developer will conduct scored accuracy/dispersion/hit/time-to-kill firing with Nico Pyrotechnic 40 x 46mm reference ammunition (purchased in accordance with MIL-C-63239B (AR) Amendment 5, Military Specification Cartridge 40mm Practice, M781).

(d) **Reference/ Over Pressure Cartridge:** The material developer will conduct pressure testing using the following round: Nico 40mm x 46, Proof Cartridge.

2.3 **Baseline.** The EGLM will be tested and evaluated against the following weapons and their configurations: 1. M-79, shoulder fired grenade launcher with mechanical sight, 2. M203, attached to a M4A1

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carbine with SOPMOD mechanical leaf sight, and 3. M203, attached to a M4A1 carbine with a AN-PSQ-18 integrated sight.

2.4 Order of Precedence. In the event of a conflict between the text of this document and the references cited, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

NOTE: Required and Desired Features. Section 3, REQUIREMENTS, designates required or desired features as [KPP], [APA], or [Future Objective]:

(a) **Key Performance Parameters (KPPs):** KPPs are Go (Pass) NO-GO (Fail) test events, however both KPPs and APAs may be evaluated to provide "Best Value" source selection information. KPP (O) values and APA (T) and (O) values are the equivalent of research and development goals. The government will test all submissions for KPP threshold compliance. However, the government may or may not test APAs or KPP objectives based upon availability of resources. This specification designates Key Performance Parameters (requirements) by an annotation "[KPP]".

(b) **Additional Performance Attributes (APAs):** APAs are scored testing events. APAs are tradable parameters that are used to measure effectiveness and performance. Failure to meet either (T) or (O) requirement values specified in an APP does not remove a submission from further testing. APAs are evaluated to provide information leading to a best value award determination. Specific parameters that are to be designated, as Additional Parameter Attributes (APA) shall be identified with the annotation "[APA]".

(c) **Future Objective:** Future Objectives are provided for information purposes only.

3.1 System Requirements.

3.1.1 Product definition and configuration. The EGLM System consists of three primary components [KPP]:

- EGLM weapon (which includes an integrated fire-control sub-system)
- EGLM stock assembly
- EGLM M4A1 Interface

NOTE: Interfaces. The EGLM shall interface with the M4A1 carbine utilizing the MIL-STD-1913 dimensioning system. Offers may propose or utilize other supplemental interface surfaces or mechanisms provided that they also propose a reasonable means for the government to acquire the intellectual property rights required to maintain an open architecture for the SOPMOD system, to include level III drawings.

3.1.1.1 Description. The EGLM weapon shall consist of a single shot, 40mm hand, manual feed, side breaking breech, hand held launcher module that can be attached to a M4A1 interface. The EGLM weapon shall include

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a integrated fire control or aiming sub-system that will provide accurate ranging to target, an aiming solution that allows the operator to engage targets, 1st round on target (Objective) 2nd round on target (Threshold) in both day and night condition. This sighting system must zero the EGLM when mounted on the M4A1. [KPP]

3.1.1.2 Target ranging. The EGLM shall provide for a simple method of target ranging allowing grenadiers to quickly elevate the EGLM to the proper elevation (angle of fire). [KPP]

3.1.1.3 SOPMOD interface. The EGLM M4A1 interface will fit to the Standard Issue M4A1, allowing mounting of the EGLM weapon and mounting of SOPMOD accessories. [KPP]

3.1.2 Firing configurations. Operators shall fire the EGLM in two configurations [KPP]:

The EGLM shall fire from an under-slung position on the host weapon (US Army M4A1 Carbine).

The EGLM shall fire (in a stand-alone configuration) when attached to an EGLM stock assembly.

3.1.3 Capabilities. The EGLM shall provide the operator with improved combat lethality, when compared to the (baseline). Among the improved capabilities sought in the EGLM are the abilities to range targets, more rapidly engage targets and increase the hit probability from the prone, kneeling, sitting, and standing positions (supported and unsupported). [APA]

3.2 System characteristics (States and Modes of Use).

3.2.1 Transport, storage and use. The system shall withstand transport, in an un-packaged configuration, in the back of flat bed wheeled vehicles or inside of Armored Personnel Carriers traveling over rugged terrain [APA]. Further, the EGLM shall/should operate in additional environments:

3.2.1.1 Amphibious operations. The EGLM should function in an amphibious environment with minimum preparation, and must undergo immersion testing at 20.1 meters of depth (66 feet) for 2 hours (T). Immersion test at 99 feet for 2 hours (O). The EGLM shall function in amphibious operations when troops are moving from the beach/surf zone onto land. This requirement will be validated per table 7. [APA]

3.2.1.2 Airborne operations. Operators will be capable of operating the EGLM following static line and military free fall insertions (see Table 6, paragraph 3.6.2). [APA]

3.2.1.3 Over-the-Beach (OTB). The EGLM should operate when flooded with salt water-sand slurry, at an angle of 30-degree inclination, when the crown of the muzzle is at or immediately beneath the surface of the water. It is desired that the EGLM will have a safe drain time/drain procedure that operators can execute in less than 3 seconds. [APA]

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3.2.1.4 Extreme environments. The EGLM should function in extreme environments (Table 6, see paragraph 3.6.2). [APA]

3.2.1.5 Urban conditions. The EGLM shall function effectively in Military Operations Urban Terrain (MOUT) combat settings. The EGLM shall allow soldiers to engage the enemy at street level, on rooftops and behind fence lines. [APA]

3.2.2 Set-Up, assembly and disassembly. The EGLM shall allow 5 to 95% of trained operators to assemble (or disassemble) the EGLM to the host weapon or Stock Assembly in the time periods outlined in Table I, with a minimum of two hours training and without the use of special tools. [APA]

TABLE I. Assembly and disassembly times

Conditions	Assembly / Disassembly Time	
	Day	Unaided at Night
Without Gloves	30 seconds	45 seconds
Mittens	45 seconds	60 seconds
Winter Gloves	60 seconds	90 seconds
MOPP 4 Gear	60 seconds	90 seconds

3.2.2.1 Tools. The operator must be able to attach the EGLM without the use of Special Tools to install/remove the EGLM to/from the weapon or to/from the stock assembly. [APA]

3.2.2.2 Installation and removal. EGLM system should allow operators to install/remove the EGLM weapon from the EGLM M4A1 Interface and EGLM Stock Assembly in complete darkness. [APA]

3.2.3 Operator firing positions, conditions and equipment The EGLM design shall permit the operator full operational capability from the prone, kneeling, sitting, and standing positions. The EGLM design shall allow operators the ability to operate the weapon with winter gloves, body armaments, and Nuclear, Biological and Chemical (NBC) gear. [APA]

3.2.4 Target definition/accuracy/aiming requirements. The EGLM system shall allow operators to detect, range, aim, fire, reload and continue engagements of dismounted infantry and vehicle targets.

3.2.4.1 Infantry targets. The EGLM system shall allow operators to fire projectiles capable of engaging infantry targets at unknown ranges between 25-300 meters (T). Engage infantry targets at unknown ranges between 25-400 meters (O). A successful engagement is defined as a projectile landing within 5 meters of a designated point target. [APA]

3.2.4.2 Vehicle/bunker targets. The EGLM system shall allow operators to fire projectiles capable of engaging targets at unknown ranges to 300 meters (T) and 400 meters (O). A successful engagement is defined as a projectile landing within 5 meters of a designated target (20'L X 8"W X 5'H). [APA]

3.2.4.3 Ranging capabilities. The EGLM system shall provide target-ranging capabilities out to 1000 meters. [APA]

3.2.4.4 Reference ammunition. See paragraph 2.2(C)

3.3 Key performance requirements, features and characteristics.

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3.3.1 Performance requirements (target engagement).

3.3.1.1 40mm Engagement/reduced time to kill. The EGLM system design shall allow 80% of trained operators to (re) load the EGLM, fire, and hit multiple targets (see paragraph 3.2.4) from all firing positions (see paragraph 3.2.3) at various ranges, which are unknown to the operators as defined herein:

3.3.1.1.1 The EGLM shall reduce the time required to engage a target set when compared to the M203 baseline. [APA]

3.3.1.2 M4A1 (host weapon) engagement. When the EGLM weapon and M4A1 Rail mount are attached to the M4A1 Carbine (host weapon), the EGLM shall allow soldiers to readily reload the magazine and operate the M4A1 Carbine. The EGLM shall not preclude normal operation of the M4A1 carbine weapon (including those with sound suppressors) and shall not degrade dispersion of the 5.56 M4 SOPMOD rifle more than 0.5 mils (at 25 meters). [APA]

3.3.1.3 Hits per operator load. The EGLM shall increase the probability of successfully hitting both infantry and vehicle target sets out to a maximum range of 400 meters: [APA]

3.3.1.3.1 Probability of hits. When measured against the baseline, the EGLM shall improve the overall probability of projectiles hitting targets. [APA]

3.3.2 Weapon characteristics and features.

3.3.2.1 Launcher sub-system.

3.3.2.1.1 Weapon trigger. The EGLM weapon shall incorporate a double action trigger that allows both accurate firing and the ability to re-strike without opening the breech, under conditions of extreme fouling or other interference with the firing pin. [APA]

3.3.2.1.2 Cartridge ejection. The EGLM shall partially eject spent cartridge casings under extreme operating and environmental conditions, and retain unexpended (live) cartridges, when breech is opened. EGLM shall allow for manual extraction of the cartridge as an emergency extraction feature, should the mechanical extraction fail. [APA]

3.3.2.1.3 Breech lock. The EGLM shall incorporate a Breech Lock that will not allow inadvertent opening of the breech under any operational conditions. The breech shall open unassisted by the operator when the Breech Lock release is depressed. The Breech Lock shall be ambidextrous for left and right-handed shooters to operate with their index finger. [APA]

3.3.2.1.4 Pistol grip. A removable pistol grip is desired on the EGLM receiver. [APA]

3.3.2.2 Fire control sub-system features.

3.3.2.2.1 Ballistics. The EGLM Weapon Fire Control should provide multiple ballistic solutions (for different ammo types). The default

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solution should function with the M433 cartridge. (Accuracy testing will be accomplished in accordance with paragraph 3.2.4) [APA]

3.3.2.2.2 Eye relief. The EGLM should optimize eye-relief both in daytime use and with Night Vision Devices (NVDs). [APA]

3.3.2.2.3 Bore sight retention. When set, the EGLM should retain bore sight for a 100 rounds fired. (Unless the weapon experiences a shock equivalent to being dropped from a height greater than 5 feet onto concrete). [APA]

3.3.2.2.4 Fall of shot adjustments. The EGLM Fire Control shall allow for a trim/fall of shot adjustment to allow for lot-to-lot adjustments and correction for other errors. [APA]

3.3.2.2.5 Night vision devices (NVDs) compatibility. The EGLM shall function effectively when operators use goggles or helmet mounted clip-on devices [APA]:

AN/PVS-7A/B/C/D

AN/PVS-14/15/18 and 21

3.3.2.2.6 System spill light. The EGLM should minimize the visible spill light signature observed, within 50 meters during limited visibility conditions (T) 20 meters (O). [APA]

3.3.2.2.7 Backup sight. If the EGLM sight uses battery power, the EGLM shall incorporate a secondary sight that will function in the event the primary sight becomes inoperable. Backup sight shall be adjustable for Windage and elevation and be capable for ranges out to 400 meters. It is desired that the adjustment device incorporate a locking mechanism to prevent inadvertent movement once zero is set. [KPP]

3.3.2.3 Butt stock features. The EGLM stock assembly shall provide for multiple settings (or set-ups) adjusting the distance between the shoulder-rest to trigger for 5 to 95% of the operators. If the EGLM weapon does not include a pistol grip, the EGLM stock assembly shall include a pistol grip. [APA]

3.3.2.4 Ambidextrous operations. The EGLM system should readily accommodate both left and right hand operators. The EGLM configuration may allow for a unit maintenance set-up change (e.g. left/right sight alignment or left/right hand breech-break settings are adjusted by 2nd echelon maintenance personnel). [APA]

3.3.2.5 Sling attachment points. The EGLM should have sling attachment points that provide mounting to a: one, two or three point sling to the left or right. [APA]

3.3.3 Compatibility, accuracy and dispersion.

3.3.3.1 M4A1 accuracy and dispersion. When the EGLM weapon and EGLM M4A1 Interface are fitted to the M4A1 carbine, these components shall not degrade the accuracy, function, or reliability of the M4A1 carbine 5.56 fire. [APA].

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3.3.3.2 Ammunition. The EGLM shall fire the current family of U.S. munitions to include: Training, High Explosive, Illumination, and Non Lethal (T) Future Objective: High Explosive Duel Purpose-Triple Mode (HEDP-TM) (O). [KPP]

3.3.3.3 Ammunition ballistics. See paragraph 2.2

3.3.4 Operator controls and tactile features. Knobs, levers, and detents should have tactile surfaces designed for easy gripping to include a means for the operator to feel adjustments. The knobs and adjuster will also keep the settings i.e. Class C type detent. [APA]

3.4 System physical requirements and characteristics.

3.4.1 Dimensions. The EGLM weapon (detached from the host weapon and detached from the butt stock) shall not exceed 16 inches in length. The EGLM barrel shall be 7-12 inches in length. It is desired that the EGLM barrel length shall be as short as possible without degrading range, accuracy, or operational performance of the grenade launcher or ammunition. [APA]

3.4.2 Weight. EGLM weights should conform to the requirements listed in Table II, below:

TABLE II. EGLM weight table

EGLM Component	Maximum Weight (Threshold)	Desired Weight (Objective)
Stock Assembly	3.5 lbs	1.0 lbs
Weapon (and Fire Control)	6.5 lbs	2.0 lbs
M4A1 Interface	3.0 lbs	1.0 lbs
EGLM Weight Added to M4	9.5 lbs	3.0 lbs
EGLM Stand Alone Weight	10.0 lbs	4.0 lbs

3.4.3 Finish. The EGLM should have a dull, non-reflective taupe exterior finish. Exact shade will be determined prior to full rate production. [APA]

3.5 Reliability, durability and service life requirements.

3.5.1 Reliability. The EGLM's reliability shall conform to the requirements outlined in Table III, below:

TABLE III. EGLM reliability requirements

EGLM	Required (Threshold)	Desired (Objective)
Mean Rounds Between Failure (MRBF)	1500	5000
Mean Rounds Between Stoppage (MRBS)	200	500
Mean Time to Failure (MTTF) (For EGLM Fire Control)	1000 hours	4800 hours

3.5.2 Mean time to repair (MTTR). The EGLM design should allow all unit maintenance personnel to perform preventative and cyclic maintenance in less than 10 minutes for the EGLM. The Mean Time to Repair (MTTR) at the unit level for the EGLM shall not exceed 0.5 hours. The time to repair

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is defined, as the total time required restoring the EGLM and mounts to operation, including diagnostic time. At Direct Support, the MTTR shall be one hour or less. [APA]

3.5.3 Receiver/barrel service life. The EGLM Receiver and barrel will be tested for endurance by firing 5,000 rounds. Grenade Launchers shall complete the 5,000 round tests without requiring overhaul. Grenade Launchers meeting this requirement may continue firing until overhaul is required or 10,000 rounds have been fired. [APA]

3.5.4 Battery life. If batteries are used, the EGLM shall function for at least 100 hours of continuous operations "on time." [APA]

3.5.5 Low Power Feature: If batteries are used, a low power (power) indicator is highly desired. [APA]

3.5.6 Rounds counter. The EGLM should contain a rounds counter that allows unit operators and maintenance personnel to conduct regular cyclic maintenance on the EGLM. [APA]

3.6 Environmental performance requirements.

3.6.1 Electromagnetic performance parameters.

3.6.1.1. Radiated emission. While operating, radiated electric field emissions emanating from EGLM shall not exceed the limits of figure RE102-4 of MIL-STD-461E (Navy Mobile and Army) when tested in accordance with test method RE102 of MIL-STD-461E. [APA]

3.6.1.2 Conducted emission. When connected to external power sources, the EGLM system shall not exceed the limits of Figure CE102-1 of MIL-STD-461E when tested in accordance with test method CE102 of MIL-STD-461E. If the unit is not connected to external power sources, then this requirement is inapplicable. [APA]

3.6.1.3 Radiated susceptibility. The EGLM system shall not exhibit signs of susceptibility when subjected to the electric fields outlined in Tables IV and V, when tested in accordance with test method RS103 of MIL-STD-261E. [APP] NOTES: Either the RMS field or the AM field shall be used, but only one is required. The RMS field is defined as non-AM, and the AM is defined in test method RS103 of MIL-STD-461E.

TABLE IV. Electromagnetic radiation hazard

<i>Frequency range MHz</i>	<i>E-field V/m, RMS</i>	<i>E-field V/m, Peak</i>	<i>Polarit y V/H</i>
1 - 20	100	200	V
20 - 100	200	200	V + H
100 - 1000	200	400	V + H

TABLE V. Electromagnetic radiation operational parameters

<i>Frequency range</i>	<i>E- field</i>	<i>Modulation</i>	<i>Polarity V/H</i>
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MHz	V/m		
80 - 100	20	AM	V + H

3.6.2 Environmental performance parameters. The EGLM should meet the performance requirements specified in Tables VI and VII below. [APA]

TABLE VI. Environmental requirements list #1

Environmental Factor	Recommended test Severity	Reference		
Low pressure	30,000 ft ASL equivalent at -57°C	MIL-STD-810F Method 500.4, Procedure I+II		
Low Temperature	-40°C	MIL-STD-810F Method 502.4, Procedure I+II		
High Temperature	+71°C storage	MIL-STD-810F Method 501.4, Procedure I+II		
Temperature Shock	+71°C/-51°C, 3 cycles á 24 h	MIL-STD-810F Method 503.4 Procedure II		
Solar radiation	1120 W/m ² at +42°C during 3 h	MIL-STD-810 F Method 505.4, Procedure I		

TABLE VII. Environmental Requirement List #2

Environmental Factor	Recommended test Severity	Reference		
Humidity	+30°C/+60°C, 85-95 % RH, 10 days	MIL-STD-810F Method 507.4		
Immersion	66 feet of salt water for 2 hours (T) 4 hours (O)			
Ice	Ice 13 mm thickness	MIL-STD-810F Method 521.2		
Salt fog	5 % NaCl, +35°C for 48 h	MIL-STD-810F Method 509.4		

3.6.3 Vibration. The EGLM shall meet the shock and vibration requirements listed in Table VIII below. [APA]

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TABLE VIII. Shock and vibration requirements listing

Environmental Factor	Reference	Remarks
Vibration	MIL-STD-810F Method 514.5, Category 10	
Rough Handling	MIL-STD-810F Method 514.5 Category 5	
Drop Test Un-packaged		One meter drop onto polyethylene mat backed by ¾" plywood and concrete.

3.7 External interface requirements.

3.7.1 M4A1 Carbine. The EGLM's M4A1 Interface shall mount securely to the M4A1 and be free floating from the host weapons barrel. This mounting shall be accomplished without the use of special tools at the operator's level. [APA]

3.7.2 MIL-STD-1913 Interface Requirements. The EGLM's rails shall/should conform to the requirements of Table IX below.

TABLE IX. EGLM MIL-STD-1913 interface requirements

EGLM	Required (Threshold)	Desired (Objective)
EGLM M4A1 Interface	6' o'clock rail	3' 9' 12' o'clock rail
EGLM Weapon	12' o'clock interface/grip to M4A1 Interface	3' 6' 9' o'clock rails

Note: Operators must be able to attach EGLM Weapon to the EGLM M4A1 Interface 6' o'clock rail without use of any special tools, while wearing cold weather and NBC gloves. [APA]

3.7.3 SOPMOD Accessories. The EGLM should function with the following SOPMOD accessories mounted to MIL-STD-1913 rails on the M4A1 Interface [KPP] or to the EGLM Receiver [APA]:

- Backup Iron Sights (BIS) (Stock Number 1005-01-449-6306)
- Infrared Target Pointer/Illuminator/Aiming Laser (AN/PEQ-2) (Stock Number 5855-01-422-5253)
- Carbine Visible Laser (AN/PEQ-5) (Stock Number 5860-01-439-5409)
- Enhanced Combat Optical Sight-Navy (Stock Number 1240-01-495-1385)
- Reflex Sight (Stock Number 1240-01435-1916)
- Visible Light Illuminator (VLI) (Stock Number 5855-01-448-5464)
- Visible Bright Light II (VBL II) (Stock Number 5855-LL-L99-7589)
- ACOG 4x Day-scope (Stock Number 1240-01-412-6608)

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3.8 Pre-Planned improvements, upgrades and product growth (spiral development, open architecture).

3.8.1 Programmable ammunition (future objective). The EGLM design shall accommodate the upgrading of the EGLM [via future US government Engineering Change Proposal (ECP)] to fire a new generation of Programmable 40 x 46mm Ammunition (air burst, point detonation, or delayed detonation).

3.8.2 Other munitions. The EGLM shall be capable of firing cartridges with greater mass. (The maximum case mouth pressure of these heavier cartridges shall not exceed 230 bar.) [APA]

3.8.3 Ballistic solution upgrades. The EGLM Fire Control will provide primary aiming solution for 40mm munitions with the option of adapting aiming solutions for multiple ammunition types that have different ballistics (i.e., 5.56mm). Either 2-3rd echelons of maintenance may accomplish the upgrading of EGLM ballistic solutions. [APA]

3.8.4 SOF Combat Assault Rifle (SCAR). EGLM shall be forward compatible with the SCAR. See References: Performance Specifications for the SOF Combat Assault Rifle (SCAR) Light (Crane PS/4081/C03/1337) and Performance Specifications for the SOF Combat Assault Rifle (SCAR) Heavy (Crane PS/4081/C03/1338)

3.8.5 Additional Pre-Planned Improvements, Spiral Development (Future Objective) can be found in the SOPMOD EGLM ORD Annex, listed under Increments 2-4.

3.9 Operating safety and complexity.

3.9.1. Safety. Firing of the EGLM shall not pose a safety hazard to the operator or nearby personnel during handling, transport, storage or use (see AR 385-16). The EGLM system shall conform to the guidelines in TOP 3-2-045.

Safety System Requirements: The EGLM shall comply with the requirements specified in MIL-STD-882D and the general requirements of MIL-STD-454.

The EGLM shall incorporate a manual safety lever.

Safety Markings: The weapon shall include a safe/fire switch with positive stops. The EGLM shall include engraved, etched, raised, or stamped "S" (for safe) and "F" (for fire) markings on the weapon housing. The switch shall have corresponding "S" marked in an indelible white color and an "F" letter indelibly marked in red.

Laser Safety: Any range finder lasers shall conform to the requirements of SPAWARINST 5100.12B, Table 8. If the EGLM sighting/aiming sub-system incorporates a laser, the laser shall be classified and labeled by the manufacturer in accordance with CFR Title 21, Part 1040.10. This device shall present no new health or safety (electrical, optical or other) hazard to the user and/or bystander.

If Lithium-Sulfur Dioxide batteries are used in the EGLM, the battery compartment will conform to the safety guidelines in CECOM TB-7 (Rev A) October 1997. [KPP]

3.9.2 Metal fatigue. During the product life, the EGLM shall not display metal fatigue that could lead to a catastrophic failure of the barrel, weapon receiver or M4A1 interface (as determined by the test

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activity. See ASTM E709, ASTM E1417 and ASTM E1333). [APA]

3.9.3 Over-pressure cartridge. The EGLM shall not display metal fatigue after test function with an overpressure cartridge with a maximum pressure of 230 bar. [APA]

3.10 Design and construction.

3.10.1 Rough handling. The EGLM should withstand rough handling with no degradation in accuracy or physical damage other than normal scratches to the protective coating. [APA]

3.10.2 Serial number. Each EGLM weapon shall have an individual serial number applied to the receiver in accordance with MIL-STD-130K. [KPP]

3.10.3 Electronic workmanship. The EGLM's electronics should conform to requirements of ANSI IPC J-STD-001A and MIL-HBK-454A. [APA]

3.10.4 Surface finish. The EGLM's should have continuous surfaces free from pits, scratches, and gouges in accordance with ANSI B46.1. [APA]

3.10.5 Fasteners. Where fasteners are used, the EGLM manual should specify torque requirements. [APA]

3.10.6 Interchangeability. The EGLM design and the contractor's Integrated Logistics Support (ILS) program shall conform to Guideline 7 of MIL-HDBK-454A. The system design and ILS program shall ensure that the device assemblies, sub-assemblies and replacement parts physically and functionally interchange at the Line Replaceable Unit (LRU) level without modification of the fielded equipment. [APA]

3.10.7 Weapon operation. The EGLM system, when mounted on the M4A1 rifle/carbine, shall not interfere with the operator's ejection/loading of the 5.56 magazine, function of the iron sight or eyesight alignment of the operator and rifle/carbine. [APA]

3.10.8 SOPMOD accessories. The EGLM should not interfere with the normal use of the SOPMOD accessories listed in paragraph 3.7.3. [APA]

3.10.9 Chemical compatibility. EGLM components should not deteriorate due to exposure to chemicals used in the maintenance of weapons. The EGLM maintenance manual shall define any limits on the EGLM's compatibility with chemicals normally used in DoD weapon maintenance activities. [APA]

3.10.10 Protective coatings. EGLM internal and external components should have coatings to protect the base materials from corrosion. [APA]

3.10.11 Maintenance modularity. The EGLM weapon design should allow for modular swap out of the fire control unit at the 1st or 2nd maintenance echelon. [APA]

3.10.12 Ozone depleting chemicals (ODCs). The EGLM producer shall minimize or eliminate the use of ODCs in the manufacture of EGLMs wherever possible. [APA]

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3.10.13 Butt stocks. Butt Stock designs should minimize the “felt recoil” of the operator. The EGLM may include an accessory to use an alternate butt-stock in lieu of the standard M4 butt stock. [APA]

4. VERIFICATION

4.1 Developmental testing (DT). The Material Developer shall validate the technical performance of the EGLM in accordance with the requirements listed in this specification and the guideline in DA Pam 73-4. The material developer may validate requirements through analysis. If necessary, DT will incorporate “fix-to-shoot” methodology to complete each round of testing. The fix-to-shoot approach allows test technicians to perform rapid corrections or repairs to broken or malfunctioning test articles to allow the articles to complete testing. The degree of correction/repair will be dependent upon the test site’s capability and vendor interaction. The government seeks a “Best Value” acquisition. The government may therefore consider innovative technical capabilities related to, but not envisioned or specifically called out by this specification. Therefore, offerors may include other closely related combat capabilities in the system that they offer for DT. DT may implement exploratory testing on ancillary or alternative capabilities offered over and above this specification’s requirements. Exploratory DT results may be used for source selection information. Table X list testable items and the applicable requirements paragraph.

TABLE X. DT tests

T=Test or Inspect A=Analysis		
Item		Reference
Product Configuration	A	3.1.1
Weapon	A	3.1.1.1
Ranging	A	3.1.1.2
Firing Configurations	T	3.1.2
Capabilities	T	3.1.3
Extreme Environments	T	3.2.1.4
Special Tools	T	3.2.2.1
M4A1 (Host Weapon) Engagement	T	3.3.1.2
Trigger	T	3.3.2.1.1
Cartridge Ejection	T	3.3.2.1.2
Breach Lock	T	3.3.2.1.3
Pistol Grip	T	3.3.2.1.4
Fire Control Ballistics	T	3.3.2.2.1
Bore Sight Retention	T	3.3.2.2.3
Back up Sight	T	3.3.2.2.7
M4A1 Accuracy and Dispersion	T	3.3.3.1
Ammunition Compatibility	T	3.3.3.2
Dimensions	T	3.4.1
Weight (Threshold) (Table 2)	T	3.4.2
Weight (Objective) (Table 2)	T	3.4.2
Finish	T	3.4.3
Reliability (Threshold) (Table 3)	T	3.5.1
Reliability (Objective) (Table 3)	T	3.5.1
MTTR	T	3.5.2

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Battery Life	T	3.5.4
Low Power Indicator	T	3.5.5
Round Counter	T	3.5.6
Radiated Emission	T	3.6.1.1
Conducted Emissions	T	3.6.1.2
Radiated Susceptibility	T	3.6.1.3
Environmental Performance (Tables 6 + 7)	T	3.6.2
Shock and Vibration (Table 8)	T	3.6.3
EGLM Rail Mount	T	3.7.1
Rail Interface (Table 9)	T	3.7.2
SOPMOD Accessory	T	3.7.3
Other Munitions	T	3.8.2
Ballistic Solutions	T	3.8.3
Safety	T	3.9.1
Metal Fatigue	T	3.9.2
Overpressure Cartridge	T	3.9.3
Rough Handling	A	3.10.1
Serial Number	T	3.10.2
Electronic Workmanship	T	3.10.3
Surface Finish	T	3.10.4
Interchangeability	A	3.10.6
Weapon Operation	T	3.10.7
Chemical Compatibility	T	3.10.9
Protective Coatings	T	3.10.10
Maintenance Modularity	A	3.10.11
ODC	A	3.10.12
Butt Stock	A	3.10.13

- 4.2 Operational testing (OT). The results of actual special operations scenarios during OT&E shall be included in both KPP and APA evaluation. The designated Independent Operational Test and Evaluation (OT&E) activity shall develop a test plan for the EGLM containing measurable operational criteria. Test plans will utilize STRAC Manual Chapter 5 (DA-Pam 350-38), Infantry Weapons Systems, and will comply with U.S. Code Title 10 and applicable supplemental regulations and documents (see references). Test samples will undergo OT in accordance with approved Operational test Plan. The government seeks a "Best Value" acquisition. The government may therefore consider innovative technical capabilities related to, but not envisioned or specifically called out by this specification. Therefore, offerors may include other closely related combat capabilities in the systems that they offer for OT. OT may implement exploratory testing on ancillary or alternative capabilities offered over and above this specification's requirements. Exploratory OT results may be used for source selection information. The Material Developer shall verify the EGLM's manual conformance to the requirements of paragraph 6.1.

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TABLE XI. OT tests

Item	Reference
Transport (APA)	3.2.1
Amphibious Operations (APA)	3.2.1.1
Airborne Operations (APA)	3.2.1.2
Over the Beach (APA)	3.2.1.3
Urban Environment (APA)	3.2.1.5
Setup, Assembly, Disassembly (APA)	3.2.2
Install/Removal from Stock (APA)	3.2.2.1
Install/Removal from the Rail Mount (APA)	3.2.2.2
Operator Firing Positions, Conditions and Equipment (APA)	3.2.3
Infantry Targets (APA)	3.2.4.1
Vehicle/Bunker Targets (APA)	3.2.4.2
1000 meter ranging (APA)	3.2.4.3
Time to Kill (APA)	3.3.1.1.1
Hits per Load (APA)	3.3.1.3.1
Hits per Load (APA)	3.3.1.3.2
Eye Relief (APA)	3.3.2.2.2
Fall of Shot Adjustment (APA)	3.3.2.2.4
Night Vision Compatibility (APA)	3.3.2.2.5
Spill Light (APA)	3.3.2.2.6
Butt Stock (APA)	3.3.2.3
Ambidextrous Operations (APA)	3.3.2.4
Tactile Features (APA)	3.3.4

4.3 Correction/repair during tests. DT may incorporate "fix-to-shoot" methodology at the discretion of material development activity. The fix-to-shoot approach allows test technicians to perform rapid corrections or repairs to broken or malfunctioning test articles to allow the articles to complete testing. The degree of correction/repair will be dependent upon the test site's capability, availability of "on call" vendor support and spare parts. The test activity will document the labor time and material costs of repairs.

4.4 Serial production tests and examinations.

4.4.1 Quality assurance procedures. EGLM manufacturing process controls shall include Quality Assurance Provisions (QAPs) for major sub-system and sub-assemblies. These Quality Assurance Provisions shall include verification of manufacturing/assembly controls and factory acceptance tests, which include actual function fire, proof firing and post firing Magnetic Particle Inspection (MPI).

4.4.2 Quality control and production acceptance plans. EGLM Quality Control and Acceptance Plans will conform to standardized sampling plans that include functional testing to confirm: (1) the correct assembly of the system, (2) the function of sub-system components, and (3) transmission of all interface signals between sub-system. Manufacturing and assembly controls shall include the establishment of capable processes with attention to continuous process improvement. The quality system shall contain a method for monitoring and controlling critical processes and product variation, including provisions for effective root-

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cause analysis and corrective action. Acceptance testing shall include function fire and post MPI inspection with an overpressure cartridge. (The overpressure cartridge shall exert a maximum pressure of 230 bar.)

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DOD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

5.2 Vendor commercial packaging. Each Primary EGLM component (weapon, stock assembly and M4A1 rail mount) shall have separate packaging and bar-code labels/stock numbers.

5.3 Basic issue items. The EGLM weapon package shall include a (1) Cleaning kit, (2) operator's manual, (3) muzzle cap, (4) and sling with each EGLM weapon.

5.4 Optional accessories. The EGLM optional accessories shall include a rugged storage case to store the entire EGLM kit, and may include an M4 butt-stock.

5.5 Commercial packaging. Commercial Packaging shall insure that the product does not degrade during storage and transport by commercial air/truck and cargo ships for a period of up to 9 months. Commercial packaging shall preclude degradation encountered in outdoor storage for up to 6 months. The commercial packaging must preclude oxidation of metals.

6. NOTES

6.1 Manuals.

6.1.1 Operator manual. The operator's manual shall conform to the requirements of MIL-PRF-63016B(TM) (Type 10). The manual shall be no larger than 4-½ in. tall by 6 in. wide.

6.1.3 Copyright release. The contractor will provide a signed copyright release for all deliverable manuals giving the government permission to reproduce and use copyright information. (APA)

6.2 Power supplies/batteries. In the case of offers that propose subsystems that utilize batteries, the batteries must be common and commercially available. The battery (s) shall be able to be replaced by the operator with one hand, without using tools, and without removing the sub-system from the host weapon. The battery lid shall have a lanyard or other loss-prevention mechanism connected to the sub-system body. The batteries common and commercially available, shall be:

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Battery, Non-rechargeable, NSN 6135-01-351-1131, or a commercially available battery equivalent to it, such as the DL 123-series

BA-3058/U 1.5 volts, AA size NSN 6135-00-985-7845, or a commercially available battery equivalent to it.

DL 1/3, N3 volts battery, NSN 6135-01-398-5922, or a commercially available battery equivalent to it.

AA Lithium 3.9 volt size (Part Number 205129-006), or a commercially available battery equivalent to it. [APA]

6.3 Lubrication. The EGLM shall not require excessive oil on any parts.

6.4 Marking and labels.

6.4.1 Markings. The EGLM system shall conform to the requirements of MIL-STD-130K (Identification Marking of U.S. Military Property) and MIL-STD 129N to include the following: (1) EGLM item name/nomenclature, (2) unique serial number, (3) manufacturer, (4) contract number, (5) warranty expiration date, and (6) part number with revision level.

6.4.2 Labels. The EGLM shall include labels for any operator adjustable items.

6.4.3 Laser markings. If the EGLM aiming/sighting system incorporates a laser, the laser shall have identification/power level markings in accordance with U.S. Regulatory Agency requirements.

6.4.4 EGLM spare part packages. Markings shall conform to MIL-STD-129N.

6.5 Basic load. A basic load of 40mm LV (40x46mm) ammunition is 18 cartridges.

6.6 Definitions. The following terms are defined below:

Accuracy: Accuracy is defined as the miss distance between the aim-point of the EGLM system and the center of a population of hit points.

Cycles. A cycle is defined as 10 seconds ON, 2 seconds OFF.

Dispersion. The fall of population within a specified limit.

1 σ Dispersion. 68.26% of a population shall fall within a 1 σ limit.

2 σ Dispersion. 95.44% of a population shall fall within a 2 σ limit.

Fix-to-Shoot. The fix-to-shoot approach allows test technicians to perform rapid corrections or repairs to broken or malfunctioning test articles to complete testing. The degree of correction/repair will be dependent upon the test site's capability and vendor interaction.

Future Objective. The paragraph is for information only.

Host Weapon. May include any of the following weapons providing a 6:00 MIL-STD-1913 RIS: M4A1.

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Infantry Hit. A successful engagement of infantry is scored when a reference projectile hits the target or strikes the ground in a 5 meter (line of sight) radius measured from the E sized silhouette target. (This simulates the 5 meter burst radius provided by M433 ammunition.)

Lot-to-Lot Dispersion. The miss distance between a population of hits and the model solution for a type of ammunition.

Reference Lot. A lot of known dispersion error (from the validated ballistic table).

Sighting Failure (electronic). A failure where the operator of the system and EGLM control does not see an adjusted aim-point.

Target-Set. Two to three infantry or vehicle targets at various ranges.

Time-to-Kill. The average time required to hit multiple targets, at varying ranges.

Vehicle Hit. When a vertical target (8 ft. high x 12 ft. wide rectangular) representing a vehicle is hit by a 40mm cartridge.

Weapon Stoppage. Any event that stops the soldier from successfully chambering or firing the weapon. The operator must clear stoppages within 10 seconds in an operational environment. Any stoppage, which the material developer deems, related to test ammunition shall not count as a stoppage.

Weapon Failure. The operator is unable to clear a stoppage within 20 seconds or any circumstances that require the operator to replace parts prior to firing. Any failure to fire, which the material developer deems ammunition related, shall not count as a failure. A Failure shall be defined as any one or more of the following: (1) The occurrence of a malfunction that cannot be cleared in 10 seconds in an operational environment. A malfunction is a cessation of any ability of the system, or any of its components, to perform its intended function. A system is the item or combination of items that are under test. (2) The occurrence of a launcher condition that causes an unwarranted safety hazard to personnel. (3) The occurrence of broken or unserviceable part, which renders the launcher inoperable or unsafe if firing, is continued.

Within-a-Lot Dispersion. The population of fall when fired from a fixed EGLM barrel.

Zero/Trim. The process of adjusting the actual fall of shot to the sight solution.

6.7 Abbreviations.

AOS	Angle of Sight
APA	Additional Performance Attributes
ARDEC	Armament Research Development and Engineering Center
ASTM	American Society for Testing and Materials
BIS	Backup Iron Sight
BII	Basic Issue Items
BIT	Built In Test

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CAIV	Cost As an Independent Variable
CFR	Code of Federal Regulations
COIC	Critical Operational Issues and Criteria
DT	Developmental Testing
DODISS	Department of Defense Index of Specifications and Standards
EGLM	Enhanced Grenade Launcher Module
EMP	Electromagnetic Pulse
EMRH	Electromagnetic Radiation Hazard
EMRO	Electromagnetic Radiation Operational
ETS	Engineering Test Sample
FOV	Field of View
GFE	Government Furnished Equipment
HE	High Explosive (Anti Personnel)
HEDP	High Explosive Dual Purpose
I ²	Image Intensifier
ICD	Interface Control Document
ILS	Integrated Logistics Support
KPP	Key Performance Parameter
LORA	Level of Repair Analysis
LOS	Line Of Sight
LRF	Laser Range Finder
LRU	Line Replaceable Unit
MAIS	Major Automated Information System
MDAPS	Major Defense Acquisition Programs
MILES	Military Engagement Simulator
MOPI	Manual of Proof and Inspection procedures
MOPP	Military Operations Protective Posture
MOUT	Military Operations Urban Terrain
MRBF	Mean Rounds Between Failures
MRBS	Mean Rounds Between Stoppages
MTTF	Mean Time to Failure
MTTR	Mean Time To Repair
N/A	Not Applicable
NBC	Nuclear Biological Chemical
NVD	Night Vision Devices
ODC	Ozone Depleting Chemical
OT	Operational Testing
OT&E	Operational Testing and Evaluation
OTB	Over The Beach
STANAG	NATO Standardization Agreement
SOF	Special Operations Forces
SOPMOD	Special Operations Peculiar Modification
TBD	To Be Defined
TECOM	Test and Evaluation Command
USC	United States Code
VLI	Visible Light Illuminator